Department of Human Services, Bureau of Health, Division of Health Engineering, Wastewater and Plumbing Control Program

WASTEWATER MOUNDING IMPACT ANALYSIS

GENERAL

Intent: This Appendix is intended to be enforced **only** when other Sections of this code require its use. The intent of this Appendix is to provide a simple screening method for determining whether a site-specific modeling of waste water mounding is required. **These requirements apply to systems with design flows of 2,000 gpd or greater.**   Site evaluators may otherwise choose to use this Appendix if it seems applicable. Care must be taken when applying this chapter to assure that test holes used are truly representative of the site. The data derived should be checked against an analysis undertaken to satisfy section 1602.9. Results should also be compared to textbook values for permeability. Much of this information was adapted from Healy & May Seepage and Pollutant Renovation Analysis for Land Treatment, Sewage Disposal Systems (1982).

SLOPING SITES

General: It should be shown that the waste water effluent will not mound under the disposal field and/or surface within 50 feet down slope of disposal field(s) using the screening analysis in this Section.

Step 1: Determine the approximate location of the proposed disposal field(s).

Step 2: Locate the top of the watershed or the property line up slope of the proposed disposal field, whichever is closer to the disposal field. Dig an observation hole. Call this hole, "U."

Step 3: Based on mottling or standing groundwater, determine the depth in inches of perched seasonal water above any hydraulically restrictive horizon present in pit "U." Call this depth, "Tu."

Step 4: Dig an observation hole down slope from the disposal field, at 50 feet away or at the property line, whichever is closer to the disposal field. Call this pit, "D."

Step 5: Based on mottling or standing groundwater, determine the depth in inches of perched seasonal water above any hydraulically restrictive horizon present in pit "D." Call this depth, "Td."

Step 6: At observation hole "D," determine the depth of the seasonal water below the surface of the ground. Call this depth, "BG."

Step 7: Determine the distance in feet between the up-slope observation hole, "U," and the down slope observation hole, "D." Call this distance, "X."

Step 8: Compare "Tu" and "Td." If "Tu" is greater than or equal to "Td," the site passes the screening. If "Tu" is less than "Td," there is an increase in the perched seasonal water table (SWTI). Continue with the following steps.

Step 9: Using Table G-1 determine the hydrologic soil group that best represents the soils near the proposed disposal field. (See "Assumption 15," in Appendix F for an explanation of how to use Table G-1.)

TABLE G-1

Hydrologic soil groups vs soil profile and soil conditions

Soil Profile	Soil Conditions					
	AI	AII	B	C	D	E
1	D	C	B	C	C	D
2	D	C	B	B	C	D
3	D	C	C	C	C	D
4	D	C	B	B	C	D
5	D	C	B	B	C	D
6	D	C	A	B	C	D

7	D	C	C	C	C	D
8	D	C	B	C	C	D
9	D	C	C	C	C	D
11	D	C	B	B	C	D

Step 10: Using the hydrologic soil group determined in Step 9 above the average slope between observation holes "U" and "D," and Table G-3 determine the wet season infiltration rate in gpd/sqft. Call the infiltration rate, "RI." Thus, for a hydrologic soil group B on a 10% slope, RI = 0.38 gpd/sqft.

Step 11: Using Equation G-1, calculate the number of gallons per day falling on a one-foot-wide strip from hole "U" to hole "D." Call the result of the calculation, "Qp."

Equation G-1

Qp = (X ft)(RI)

Step 12: Use Equation G-2 to calculate how much additional waste water, in gpd/linear foot across the slope, the site can be expected to handle. Call the additional waste water, "WWf."

Equation G-2

WWf = (BG)(Qp)/(SWTI)

Step 13: Using the waste water loading rate, determine the linear feet (L) of disposal field, parallel to the topological contour, that will be needed to handle the design flow (DF) in gallons per day, using Equation G-3.

Equation G-3

L = DF/WWf

Questionable sites: If the design flow exceeds the waste water loading rate determined in the screening procedure, a site- specific hydrological study is needed.

FLAT SITE

General: A flat site shall have the capacity to transmit the septic tank effluent for an adequate distance without surfacing or mounding. On flat sites, there is a greater tendency toward effluent mounding. Most health agencies agree that travel through 50 feet of most soils will provide adequate treatment.

Screening procedure: It should be shown that the waste water effluent will not mound under the disposal field(s) using the flat-site screening analysis in this Section.

Step 1: Determine the approximate location of the disposal field.

Step 2: Locate the center of the proposed disposal field. Dig an observation hole and call this hole, "C."

Step 3: Determine the length and width of the disposal field in feet. Call the length, "L," and the width, "W."

Step 4: Use Equation G-4 to determine the area immediately under and within 50 feet of the disposal field (A) in square feet.

Equation G-4

A=(L+100)(W+100)

Step 5: Based on mottling or on standing groundwater, determine the depth of perched seasonal water in inches above any hydraulically restrictive horizon present in observation hole "C." Call the depth of perched seasonal water, "PSW."

Step 6: Also at observation hole "C," determine the depth in inches of the seasonal water below the surface of the ground. Call the depth of the seasonal water table, "BG."

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Step 7: Using Table G-1 determine the hydrologic soil group that best represents the soils near the proposed disposal field. (See "Assumption 15" in Appendix F for an explanation of how to use Table G-1.)

Step 8: Using the hydrologic soil group determined in Step 7 above and Table G-2 determine the wet-season infiltration rate in gpd/sqft. Call the infiltration rate, "RI." For example, a hydrologic soil group B has a wet-season infiltration rate of 0.50 gpd/sqft.

TABLE G-2

**Wet season infiltration vs hydrologic soil groups
on flat sites**

Hydrologic soil group	Wet season infiltration
A	0.060 gpd/sqft
B	0.050 gpd/sqft
C	0.040 gpd/sqft
D	0.030 gpd/sqft

Step 9: Using the wet season infiltration rate (RI) from Table G-2 above, calculate the number of gallons per day (Qp) falling on and within 50 feet of the disposal field, using Equation G-5.

Equation G-5

$$Qp=(A)(RI)$$

Step 10: Use Equation G-6 to calculate the additional waste water, "WW," in gallons per day that the disposal field and the site can be expected to handle.

Equation G-6

$$WW=(BG)(Qp)/(PSW)$$

Questionable sites: If the proposed design flow exceeds WW determined in this screening procedure, a site-specific hydrological study is needed.

ASSUMPTIONS USED

General: These mounding- screening analysis are based on the assumptions in this Section.

Assumption 1: The approach is a simple mass balance model assuming shallow ground water in the "interflow" and "throughflow" regime.

Assumption 2: A fraction of the annual precipitation infiltrates the soil and creates temporary perched water tables. That fraction depends on ground cover, land usage, hydrologic soil group, and the amount and duration of precipitation. Most of these factors will vary on any given site.

Assumption 3: Sloping sites with hydraulically restrictive horizons shall have the capacity to transmit the septic tank effluent for an adequate distance without surfacing or breaking out. Most health agencies agree that travel through 50 to 100 feet of most soils will provided adequate treatment.

Assumption 4: The observed differences in the depths of perched zones of saturation over hydraulically restrictive horizons are directly proportional to the volume of precipitation infiltrating the site and the ability of the zones to handle and transport the infiltrating precipitation.

Assumption 5: The model assumes that the maximum elevation in the perched zones of saturation occur in early spring.

Assumption 6: The percentage of spring-time precipitation that infiltrates the soil can be used as a gauge to evaluate how a specific site handles water. The percentage of precipitation is determined by the types of surficial geologic deposits, or by the hydrologic soil group as defined by the U.S. Soil Conservation Service. These percentages are prescribed in Tables G-2 and Table G-3.

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Assumption 7: The average annual precipitation rate is 42 inches per year.

Assumption 8: This model assumes that 100% of the precipitation falling on the entire site infiltrates into the soil, resulting in an elevation of the seasonal zone of perched saturation.

Assumption 9: The average daily infiltration resulting in an elevation of the perched zone of saturation during wet seasons of the year is determined from Tables G-2 and G-3 .

TABLE G-3

Wet season infiltration (gpd/sqft) vs hydrologic soil group on sloped sites

Slope	Hydrologic soil group			
	A	B	C	D
0-8%	.060	.050	.040	.030
8-15%	.048	.038	.037	.027
16-25%	.038	.032	.032	.023
>25%	.028	.027	.027	.020